



May 2014

CLEAR AIR FORCE STATION

Air Force Reviewed
Costs and Benefits of
Several Options
before Deciding to
Close the Power Plant

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Why GAO Did This Study

Clear Air Force Station, located in the interior of Alaska where temperatures can drop as low as -60° Fahrenheit, currently generates its own heat and power from a coal-fired combined heat and power plant. The station performs a critical radar mission for the Department of Defense, for which it is vital to have reliable sources of heat and power. Air Force Space Command has determined that the existing 50-year-old plant is operating inefficiently, and the Air Force plans to close the existing plant, after first connecting to the local power grid for electricity and constructing a new heat system for the administrative and residential areas of the installation. GAO was asked to review the Air Force's feasibility study and analyses of alternatives before the Air Force closes the plant.

This report addresses (1) the extent to which the Air Force evaluated options regarding the Clear Air Force Station combined heat and power plant and (2) what other options, if any, the Air Force considered before deciding on the alternative power source it selected. GAO reviewed the feasibility study; Department of Defense and Air Force guidance; and other analyses, contract information, and documentation related to the power plant.

GAO also issued a restricted version of this report, which includes additional details on some estimated costs. In written comments on a draft of the restricted report, the Air Force concurred with GAO's observations.

View [GAO-14-550](#). For more information, contact Brian J. Lepore at (202) 512-4523 or leporeb@gao.gov.

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CLEAR AIR FORCE STATION

Air Force Reviewed Costs and Benefits of Several Options before Deciding to Close the Power Plant

What GAO Found

The Air Force's decision to close the existing power plant at Clear Air Force Station is based, in part, on a 2010 study examining the feasibility of implementing alternative power sources at the installation in order to reduce operating costs while ensuring reliable power for the installation's mission. This study, along with other associated studies and analyses, initially led the Air Force to pursue leasing the plant to a private-sector entity or public utility. When no lease proposals were submitted, the Air Force pursued the option to close the plant, finding that the estimated costs of closing it were significantly less than the estimated costs of continuing to operate and maintain it. GAO found that the Air Force generally followed its own guidance for preparing cost estimates and analyses of alternatives. However, in the plant-closure option considered in the feasibility study, some costs—such as labor costs for operating and maintaining the new heat system—were not fully developed. While it is unlikely that adding this information would have materially affected the final outcome, more fully developing those costs would have provided decision makers with more complete information and a better understanding when considering the proposed options. In addition to economic factors, several noneconomic goals significantly influenced the Air Force's decision concerning the power plant, including the goals of no longer operating and maintaining a power plant, reducing energy costs, and ensuring reliable power for current and future missions.

Clear Air Force Station Combined Heat and Power Plant



Source: GAO.

The Air Force considered and evaluated several options for the plant's future before selecting the option to close the plant after first connecting to the local power grid and building a separate heat system. Officials said that they obtained ideas from stakeholders for the options they considered and evaluated in detail some of the options that looked more promising. Still other options were considered but were not fully evaluated because they did not generate as much savings or the Air Force did not consider them to be economically feasible. For example, the Air Force looked in detail at options for leasing the plant but did not fully assess the costs of more incremental options, such as retaining ownership of the plant but downscaling its operations. For the options that the Air Force evaluated in detail, it found that some generated significantly more savings than others and that some were not feasible from the Air Force's perspective.

Contents

Letter		1
	Background	4
	The Air Force Conducted Analyses of Various Options for Closing the Plant but Could Have Provided Additional Information	12
	The Air Force Considered Several Alternatives to Closing the Power Plant but Did Not Find Them to Be Economical, and Some Options Were Not Fully Evaluated	28
	Agency Comments and Our Evaluation	43
Appendix I	Scope and Methodology	45
Appendix II	Development of Feasibility Study	48
Appendix III	GAO Contact and Staff Acknowledgments	51
Tables		
	Table 1: Comparative Costs of Power Plant Options from Feasibility Study	17
	Table 2: Summary of Options Considered by the Air Force	35
	Table 3: Command Organizations and Offices Contacted during Our Review	46
	Table 4: Government Should Cost Estimate Summary of Costs	49
Figures		
	Figure 1: Map of Clear Air Force Station	5
	Figure 2: Operation of the Clear Air Force Station Combined Heat and Power Plant	6
	Figure 3: Facilities Energy Usage among Several Air Force Major Commands in 2012	8
	Figure 4: Map of Alaska Railbelt Transmission System near Clear Air Force Station	9
	Figure 5: Clear Air Force Station Production Capacity, Actual Production, and Energy Demand	11

Abbreviations

AFSPCI	Air Force Space Command Instruction
BTU	British thermal unit
DOD	Department of Defense
GS	General Service
ODUSD(I&E)	Office of the Deputy Under Secretary of Defense (Installations and Environment)
OSD	Office of the Secretary of Defense

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE

441 G St. N.W.
Washington, DC 20548

May 12, 2014

Congressional Committees

Clear Air Force Station, Alaska, is home to an early warning radar system that tracks near-earth satellites and provides continual ground-based missile warning to defend the United States and Canada. The installation is also home to the 13th Space Warning Squadron, assigned to the 21st Space Wing at Peterson Air Force Base, Colorado, which is part of Air Force Space Command. Clear Air Force Station is located in the interior of Alaska, where temperatures can drop to as low as -60° Fahrenheit, and it currently generates its own heat and power from a coal-fired combined heat and power plant that is over 50 years old.¹ Given the extreme winter temperatures and the criticality of the radar mission, it is vital that reliable sources of heat and power be available both for the radar facility and for the area where most of the administrative offices and living quarters are located (called the “composite area”). While the existing plant remains operational and continues to provide both power and heat for the installation, Air Force Space Command has determined that the existing plant is operating inefficiently. According to Air Force officials, the 21st Space Wing had been looking at ways to improve efficiency and cut costs for the Clear Air Force Station power plant as far back as the 1990s, including efforts to upgrade the plant. However, due to mission requirements for uninterrupted power and heat (24 hours a day, 7 days a week), the command believed that it was unable to pursue major changes until after emergency backup power for the installation’s mission was ensured. Emergency power plant generators that would provide this backup were programmed into the budget in 2004, funded in 2010, and installed in 2012. In 2008, after the emergency power plant was programmed into the budget but before it was funded, the 21st Space Wing began to explore the process of leasing the plant to a private-sector

¹For the purposes of this report, when we use the term “power,” we are referring to electricity.

entity or public utility in response to a request from the Air Force's civil engineering community for candidates for this type of action.²

The Air Force saw this as an opportunity to explore ways to resolve its long-standing concern about energy inefficiency and, following the civil engineering community's request, in 2009, the Air Force initiated a study that examined the feasibility of implementing alternative power options at Clear Air Force Station in order to reduce operating costs while ensuring sufficient reliability to support the installation's mission. This study, published in 2010, looked at several options for achieving these goals, from which the Air Force narrowed the possibilities down to those that it saw as having the greatest potential for overall savings.³ Throughout that process, the Air Force further developed the requirements, including costs, of implementing different options, with varying degrees of detail for different options. Ultimately, after the feasibility study was completed and the preferred option—leasing the plant—was dismissed due to a lack of interest (i.e., no private-sector entity or public utility submitted a proposal to lease the plant), the Air Force decided that it would take steps to close the existing plant only after first connecting to the local power grid for electricity and constructing a new heat system.

You asked us to review the Air Force's feasibility study and analyses of alternatives for Clear Air Force Station. This report discusses (1) the extent to which the Air Force evaluated options regarding the Clear Air Force Station combined heat and power plant and (2) what other options, if any, the Air Force considered before deciding on the alternative power source it selected. We also issued a restricted version of this report, which includes the Air Force's total estimated costs for its projects to connect to the local power grid and construct a new heat system.

²The Air Force intended to lease the plant under an enhanced-use lease, which allows the secretaries of the military departments to lease nonexcess land and facilities that are not for the time needed for public use, in exchange for cash or in-kind consideration, subject to several provisions. The authority for leasing is provided under section 2667 of Title 10, U.S. Code, but section 2667 does not use the term "enhanced-use lease." The services generally distinguish an enhanced-use lease from a normal outlease on the basis of scope, process, term, and consideration. For more information on enhanced-use leases, see GAO, *Defense Infrastructure: The Enhanced Use Lease Program Requires Management Attention*, GAO-11-574 (Washington, D.C.: June 30, 2011).

³Air Force Real Property Agency, *Clear Air Force Station Combined Heat and Power Plant Feasibility Study* (Nov. 29, 2010).

To determine the extent to which the Air Force has evaluated options for the Clear Air Force Station combined heat and power plant, we reviewed the documentation for the project, including the 2010 feasibility study, contract documentation, Department of Defense (DOD) and Air Force guidance, and the Air Force analyses used to document and support its final determination for the plant, including the environmental assessment and subsequent finding of no significant impact for the tie-in to the local grid and construction of a new heat system.⁴ We assessed the Air Force's analyses against Air Force guidance on economic analyses and business-case analyses and its enhanced-use lease playbook, which is used to develop enhanced-use lease projects.⁵ We also discussed the studies, analyses, contracts, and other documentation with appropriate officials from Headquarters Air Force, Air Force Space Command, 21st Space Wing, Clear Air Force Station, the Air Force Civil Engineer Center,⁶ and the U.S. Army Corps of Engineers. Additionally, we discussed the current coal supply contract for Clear Air Force Station with officials from Usibelli Coal Mine, and the grid tie-in project with an official from Golden Valley Electric Association. Further, we spoke with Defense Logistics Agency–Energy officials about the existing coal contract as well as current and potential future contracts for other fuel sources, such as diesel. Finally, we interviewed Missile Defense Agency officials for information on their roles in the current decision and the potential effect of future radar upgrades on the installation's energy needs.

To determine what other options, if any, the Air Force considered before deciding on the alternative power source it selected, we reviewed the Air Force's analyses on the options it considered, including the concept opportunity study, which first laid out some options for the plant, and the feasibility study. We also reviewed documentation related to additional analyses that were not included in those two studies. We spoke with officials from Headquarters Air Force, Air Force Space Command, 21st

⁴We did not evaluate the environmental assessment and finding of no significant impact against environmental statutes and regulations.

⁵Air Force officials indicated that the guidance for economic and business-case analyses was used to develop the feasibility study.

⁶The Air Force Civil Engineer Center is the Air Force's civil engineer field operating agency responsible for providing engineering services to installations. Its missions include, among others, facility investment planning, design and construction, operations support, real-property management, energy support, and environmental compliance.

Space Wing, Clear Air Force Station, the Air Force Civil Engineer Center, and the U.S. Army Corps of Engineers regarding how the options for the plant were vetted and the factors that affected the Air Force's decision. Additionally, we spoke with representatives of Doyon Utilities, Golden Valley Electric Association, and Aurora Energy and with plant employees regarding their perspectives on the enhanced-use lease process. Appendix I contains additional information about our scope and methodology.

We conducted this performance audit from October 2013 through May 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

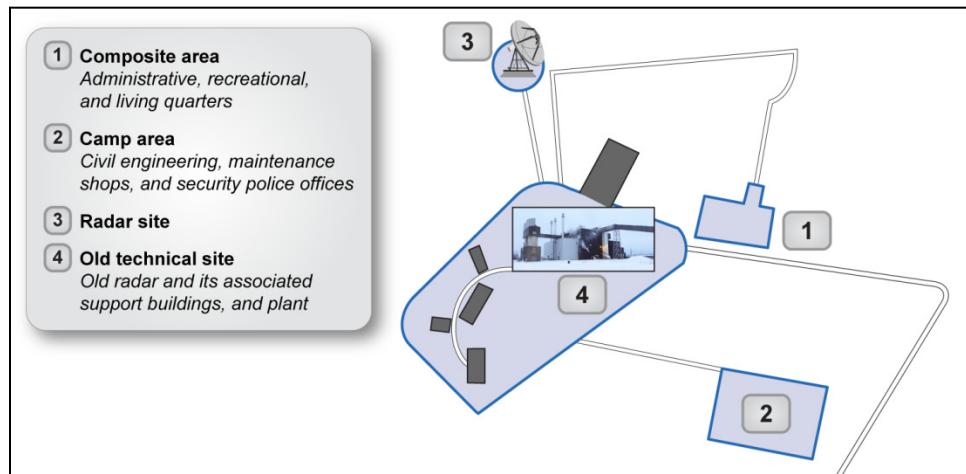
Background

History and Mission of Clear Air Force Station

Clear Air Force Station is the oldest missile warning site in North America. The installation supports the 13th Space Warning Squadron and the 213th Space Warning Squadron, Alaska Air National Guard. The 13th Space Warning Squadron is one of seven geographically separated units of the 21st Space Wing, Peterson Air Force Base, Colorado. Its mission is to provide combat capabilities through missile warning and missile defense and through space surveillance for the North American Aerospace Defense Command, U.S. Strategic Command, and the Missile Defense Agency. The mission of the 213th Space Warning Squadron is to operate and support the early warning radar. Since January 2001, these missions have been accomplished through the use of a Solid State Phased Array Radar System, which replaced the Ballistic Missile Early Warning System that had been in place since the installation became operational in 1961. The radar's primary mission is to detect missile launches to determine whether there are incoming intercontinental ballistic missiles or sea-launched ballistic missiles threatening the United States or its allies. Its secondary mission is to detect, track, identify, and generate positional data for more than 9,500 manmade objects that are in orbit in space. Approximately 300 active-duty service members, Air National Guard personnel, DOD civilians, and contract employees support the missions at Clear Air Force Station.

The developed portion of Clear Air Force Station can be separated into four main areas: (1) the composite area, where most administrative, recreational, and living quarters are located; (2) the camp area, where civil engineering, maintenance shops, and security police offices are located; (3) the radar site; and (4) the old technical site, where the old radar and associated support buildings and the plant are located. Other facilities associated with the plant include a coal yard, a cooling pond, and a rail spur—owned and operated by the Air Force—along which coal is delivered to the installation by Air Force-owned and Air Force-operated locomotives. (See fig. 1 for a map of Clear Air Force Station.)

Figure 1: Map of Clear Air Force Station

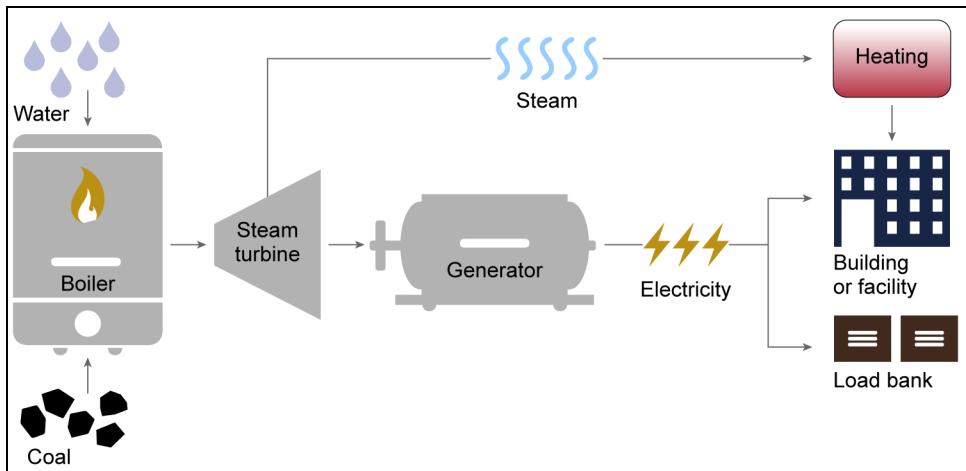


Source: GAO analysis of Air Force information.

Combined Heat and Power Plant Overview

The existing combined heat and power plant at Clear Air Force Station is owned by the Air Force and became operational in 1961. The plant burns coal in three coal-fired boilers to produce steam, which generates power through the use of steam turbine generators. As a byproduct of electricity generation, the plant delivers steam to the installation for heating via underground steam lines. The plant has three steam turbine generators, each capable of producing 7.5 megawatts of power, for a total capacity of 22.5 megawatts. The boilers and turbines are interconnected so that any boiler can be linked to any turbine generator (see fig. 2).

Figure 2: Operation of the Clear Air Force Station Combined Heat and Power Plant



Source: GAO analysis of Air Force information.

The Air Force's standard operating procedure is to run two boilers and two turbine generators at the plant concurrently in order to provide backup in the event that one component fails and to better control the power system's operating frequency.⁷ According to Air Force officials, having readily available backup steam in the winter is important because the start-up time for a boiler is about 4 to 5 hours, which is enough time for water pipes to freeze and cause damage to facilities in the meantime. Each boiler and generator runs for 8 months each year, and the boilers are rotated out of service for inspection and maintenance. In addition to the redundancy provided by running two boilers and two generators, the installation has a 300-kilowatt generator capable of providing electricity to the composite area in the event of an outage. A separate emergency power plant, which became operational in July 2012, would provide electricity and electrical heat for the radar in the event of failure of the central power plant. The Air Force currently does not have backup for heat in the composite area, which hosts most administrative, recreational, and housing facilities on the installation.

⁷Operating frequency is a measure of oscillations of the alternating current transmitted in a power system. Standard power frequency in the U.S. is 60 cycles per second (hertz).

Clear Air Force Station Energy Demand and Consumption

The energy demand at Clear Air Force Station has decreased from when the plant first became operational, due to the radar replacement in 2001. The previous Ballistic Missile Early Warning System radar required 5 megawatts of power, while the new Solid State Phased Array Radar System requires only 1.1 megawatts of power—approximately 80 percent less. Currently, the total energy demand at the installation ranges from 3 megawatts in the summer to 6 megawatts in the winter, of which approximately 1 megawatt is needed to run the plant itself. In recent years, the plant has burned an average of about 53,900 tons of coal per year. Due to the Air Force's standard operating procedure of running two boilers and two turbine generators concurrently to provide redundancy and backup, the plant's energy production typically exceeds the demand, resulting in excess steam and power.⁸ The excess power—that is, power that is not consumed—is delivered to a load bank, a device that converts the power to heat and dissipates the heat into the air.

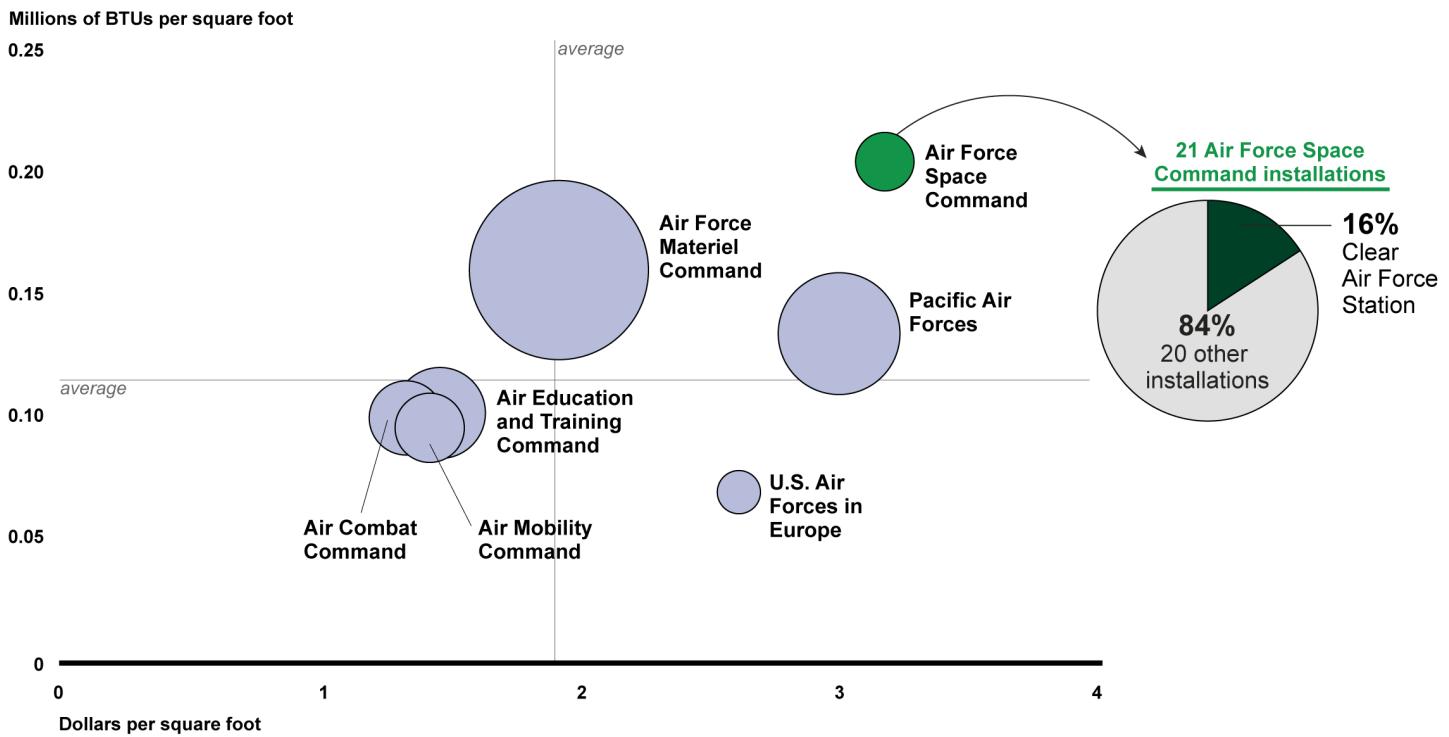
Air Force Space Command data show that, in 2012, the command led the Air Force in facilities energy consumption, with the highest energy costs and the greatest energy consumption per square foot—a metric used by the Air Force to ascertain energy efficiency—among the major commands (see fig. 3). Facilities in Air Force Space Command consume approximately 98 percent of the command's energy because its missions are facility-centric.⁹ Within the command, Clear Air Force Station consumes over 16 percent of the command's facilities energy and has a facilities energy cost per square foot that is approximately twice the command's average. Further, the installation's average energy use per square foot is approximately seven times greater than the command's average (1.39 million vs. 0.20 million BTUs).¹⁰

⁸Air Force officials told us that, prior to 2012, this requirement was driven by mission requirements to provide 99.99 percent reliability. According to officials, the Air Force Space Command guidance establishing this requirement was rescinded in 2012, which was when the emergency power plant came on line. However, the officials told us that they must continue to run two boilers and two turbines during the winter months in order to ensure that the plant provides the steam needed to prevent water and sewer lines from freezing in the event that one boiler fails.

⁹DOD defines facility energy to include energy needed to power fixed installations and nontactical vehicles.

¹⁰BTU is short for British thermal unit.

Figure 3: Facilities Energy Usage among Several Air Force Major Commands in 2012



Source: GAO analysis of Air Force data.

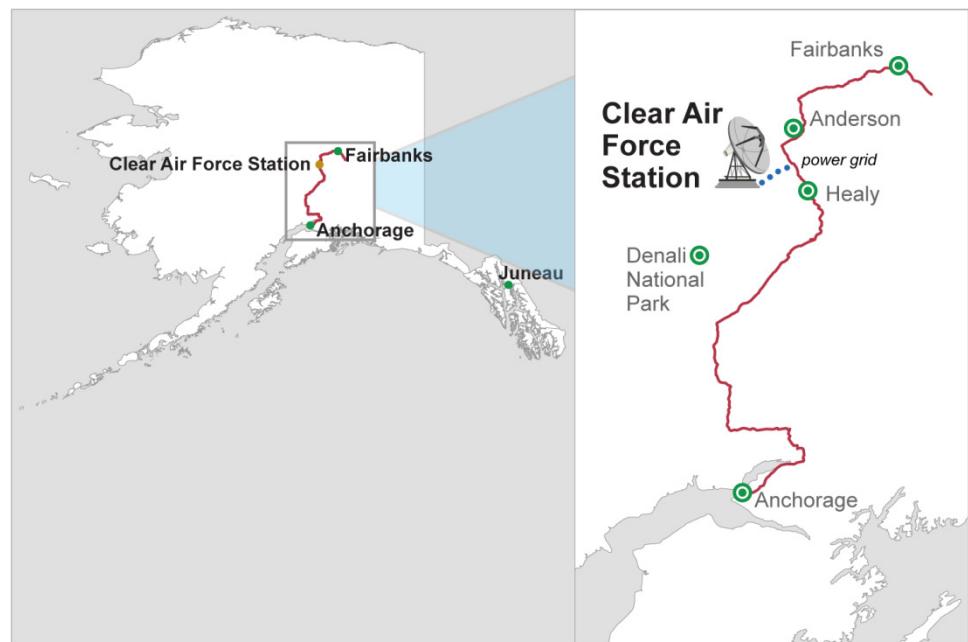
Air Force Plans and Funding Sources for Clear Air Force Station Projects

The Air Force has identified several projects that must be completed before it can close the power plant. These include constructing a new electric system connecting the installation to the local power grid, a heat system that will replace the heat function currently provided by the plant to the composite area, and a 1-megawatt backup generator to provide power to the composite area in the event of an outage on the local power grid. The portion of the power grid to which the installation will be connected is operated by Golden Valley Electric Association and is part of Alaska's Railbelt transmission system, a single transmission line spanning 600 miles. According to a 2010 Department of Energy study, power exchanges among Alaska's utilities are limited, and each public utility operates independently of others in different areas of Alaska.¹¹

¹¹Pacific Northwest National Laboratory, *Renewable Resource Development on Department of Defense Bases in Alaska: Challenges and Opportunities*, PNNL-1974 (Richland, WA: September 2010).

Golden Valley Electric Association is the only public utility located within the Clear Air Force Station service area. Figure 4 is a map of the Alaska Railbelt Transmission System near Clear Air Force Station that shows the locations of the installation, the Golden Valley Electric Association transmission line, and the proposed grid interconnection project.

Figure 4: Map of Alaska Railbelt Transmission System near Clear Air Force Station



Source: GAO.

By September 2013, the Air Force had refined its total cost estimate for the transmission and heat-system projects.¹² In late September 2013, the Air Force awarded a firm-fixed price order for an estimated \$5.2 million against an existing General Services Administration contract with Golden Valley Electric Association, the local utility that provides power to the area where the installation is located. (The Air Force issued a 120-day suspension of work order for the contract in October 2013. The suspension was extended in February 2014 for another 60 days.) As part

¹²Specific information about the Air Force's total cost estimate for these projects is included in the restricted version of this report.

of the Air Force contract, the utility will construct a switching substation at the power line closest to the installation and a 3-mile-long transmission line that will go from the switching substation to another substation that will be located on Clear Air Force Station. The transmission line and the switching substation will be owned and maintained by the utility. After construction, the Air Force will obtain electricity from the utility.¹³

Separately from the contract with Golden Valley Electric Association, but as part of the electric system, the U.S. Army Corps of Engineers plans to award a design-build contract for installation of the electrical intertie, which would include a transformer, switchgear, and a distribution substation, to distribute power from the new transmission line to facilities on the installation.¹⁴ The Air Force will own and manage the electrical intertie, and this portion of the power system will be located on the installation. The contract to be awarded by the U.S. Army Corps of Engineers would also include a new heat system to replace the heat function currently served by the plant and a 1-megawatt generator capable of providing power to the composite area in the case of an outage on the local power grid. Heat and backup power are already in place for the radar site. The steam heating system would be owned and managed by the Air Force.

The Air Force has plans to carry out these projects primarily using fiscal year 2013 funds from the Energy Conservation Investment Program, which is overseen by the Office of the Secretary of Defense (OSD).¹⁵ To the extent that funds from that source do not fully cover the costs of the projects, Air Force officials have said that they plan to make up the difference by using savings from other fiscal year 2012 funds that were previously provided by OSD. Air Force officials also said that costs may change as the Air Force enters into negotiations with contractors to refine the requirements of the components and design.

¹³Golden Valley Electric Association's rates are regulated by the Regulatory Commission of Alaska. The utility offers General Service (GS) rates to power users that do not qualify for the residential rate. The Air Force will purchase electricity at the GS-3 industrial rate.

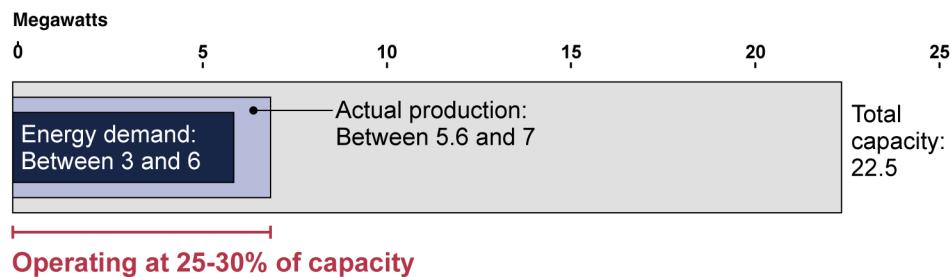
¹⁴A design-build contract is a contract with a single entity to deliver both design and construction of a project. The information provided in this report regarding cost is a subset of the information provided in our earlier, restricted report.

¹⁵The Energy Conservation Investment Program is a subset of the defense-wide military construction program that funds projects aimed at improving energy performance or reducing energy costs at DOD installations.

Environmental Regulations

The Clear Air Force Station plant is required to meet state and federal regulations related to air quality, among other environmental regulations. The plant currently operates under an air quality control operating permit issued by the Alaska Department of Environmental Conservation.¹⁶ This permit limits each of the three boilers at the plant to producing a maximum of 85,000 pounds of steam per hour.¹⁷ Further, under the permit, the Air Force has chosen to limit its coal consumption to fewer than 135,000 tons per year and has taken other steps to avoid being classified as a major source of hazardous air pollutants. The permit and the Air Force's decision to limit its coal consumption effectively cap the plant's current operations at 25 to 30 percent of its 22.5-megawatt capacity, or 5.6 to 7.0 megawatts. Figure 5 illustrates the different capacities of the plant and the current operation.

Figure 5: Clear Air Force Station Production Capacity, Actual Production, and Energy Demand



Source: GAO analysis of Air Force data.

Air Force officials told us that the plant has been operating at 5.7 to 7.0 megawatts for the past 10 years. If the Air Force should want to operate the existing plant at full capacity, it would have to address issues associated with regulations pertaining to air pollutants and air quality. For example, officials indicated that a new air model would have to be developed and reviewed by various environmental agencies to determine whether there was any deterioration in air quality at Denali National Park

¹⁶Based on its potential to emit and status as a coal-fired electric steam plant, the Clear Air Force Station plant is classified as an existing major source for both Title V and Prevention of Significant Deterioration Permitting. The permit has to be renewed every 5 years, and the permit for the Clear Air Force Station plant was last renewed in 2012.

¹⁷Each boiler is rated to produce 100,000 pounds of steam per hour.

and Fairbanks, and the Air Force would potentially need to obtain a new permit. In order to obtain a new air permit, if needed, the operator of the plant may need to install or establish additional air quality controls and monitoring requirements.

The Air Force Conducted Analyses of Various Options for Closing the Plant but Could Have Provided Additional Information

In assessing its options for power and heat generation at Clear Air Force Station, the Air Force undertook a variety of analyses, including—but not limited to—the feasibility study. The feasibility study estimated that the costs to close the plant would be less than half the costs to operate and maintain the plant as-is over the next 50 years. (The Air Force used a 50-year time frame because, according to the feasibility study, that is a standard lease period for an enhanced-use lease.) However, the Air Force could have included additional information in its feasibility study on the option to close the plant (e.g., heat system costs), particularly since this option was determined to be the most economical option for the Air Force and was identified as the option to follow if an acceptable lease offer was not received. Still, adding this information is unlikely to have materially influenced the Air Force's choice of this option over the other options that remained after the enhanced-use lease and utilities privatization alternatives had been ruled out, since the expected cost savings differed so greatly between the closure option and the other remaining options. Further, the Air Force had additional noneconomic goals, such as reducing energy costs at the installation, which it included in its assessment and decision-making process.

The Air Force Generally Followed Relevant Guidance in Preparing Its Analyses

We assessed the Air Force's processes against Air Force guidance on economic analyses and business-case analyses and its enhanced-use lease playbook, which is used to develop enhanced-use lease projects, and we found that the Air Force had generally followed its own guidance for preparing cost estimates and analyses of alternatives. As the Air Force narrowed the available options, it further refined its requirements and revised its cost estimates. The feasibility study is one step in the Air Force's process for developing an enhanced-use lease project. The study addresses the potential uses of the asset considered for the enhanced-use lease and determines the highest and best use for the property, taking into account mission-related constraints. As a guide for preparing project proposals, the Air Force uses an enhanced-use lease playbook

Enhanced-Use Lease Playbook

that was originally developed by its real-property agency.¹⁸ The feasibility study also generally follows guidelines laid out in the Air Force instruction for economic analyses¹⁹ and the Air Force manual for business-case analyses,²⁰ which provide guidance on developing analyses like those included in the feasibility study. Further, since the Air Force submitted the grid connection and heat plant project for funding under the fiscal year 2013 Energy Conservation Investment Program, the Air Force also used specific guidance for that program, which requires developing a life-cycle cost analysis for the project.

The Air Force's Enhanced-Use Lease Playbook identifies five phases of an enhanced-use lease project. The first phase, project identification, includes identifying non-excess real property that presents a potential lease opportunity. During the second phase, project definition, stakeholders determine the feasibility of the proposed project by evaluating potential risks and returns for the project. Key tasks from this phase include conducting a site-orientation visit and preparing the feasibility study. The third phase, project acquisition, analyzes the viability of the project from operational, force-protection, environmental, and financial standpoints and identifies the type of consideration that will be sought from the lessee, which can be cash or in-kind. This phase includes developing a statement of need, hosting an Industry Day,²¹ advertising a

¹⁸We reviewed the enhanced-use lease playbook that Air Force officials told us was in effect at the time of the feasibility study. This playbook was developed by the Air Force Real Property Agency, which has merged into the Air Force Civil Engineer Center.

¹⁹Air Force, *Economic Analysis*, Instruction 65-501 (Aug. 29, 2011).

²⁰Air Force, *Business Case Analysis Procedures*, Manual 65-510 (Sept. 22, 2008) (certified current Oct. 19, 2010).

²¹According to the playbook, the primary purpose of an Industry Day is to showcase the enhanced-use lease opportunity to the private-sector real-estate community, including a wide array of developers, lenders, subcontractors, and brokers.

request for qualifications,²² receiving proposals, and selecting the highest ranked offeror with which to conduct the lease negotiations. The final two phases—lease negotiation and closing and postclosing management—are undertaken after the third phase ends with the selection of a developer that will undertake the project. The Air Force took the following steps while developing the enhanced-use lease project for the power plant:²³

- **Conducted a visit to Clear Air Force Station** in May 2010, during which Air Force civil engineers performed a site survey of the installation's water, waste treatment, and combined heat and power plant; conducted a site-orientation visit to the plant; and interviewed the local public utility, Golden Valley Electric Association.
- **Prepared the feasibility study**, which was finalized in November 2010. This study incorporated the status quo estimate that had been prepared by a contractor to assess the costs of operating the plant over the next 50 years in the same manner as in 2009 and replacing items with like items, as needed.²⁴ The status quo estimate was the baseline against which five options for operating the plant were compared.
- **Held an Industry Day** on August 7, 2012, which was attended by representatives from several Alaska utilities, developers, and energy

²²The statement of need is a draft of the request for qualifications, developed prior to Industry Day and revised and converted to a request for qualifications after Industry Day. A request for qualifications is a document to solicit proposals from qualified entities interested in entering into the enhanced-use lease. As noted in the request for qualifications for the Clear Air Force Station enhanced-use lease project, proposals submitted in response are not considered offers that, upon acceptance by the government, create a contractual relationship. Instead, the Air Force would evaluate an offeror's proposal and qualifications to select a highest-ranked offeror. The Air Force would then enter into negotiations to finalize a lease and related documents with the highest-ranked offeror.

²³Our assessment of the enhanced-use lease proposal was limited to the process of developing the project and the general steps followed as part of that process. We did not assess whether the Air Force followed the playbook or other guidance in the course of soliciting offers for an enhanced-use lease because that was beyond the scope of our review.

²⁴The feasibility study identified 50 years as a standard lease period for an enhanced-use lease. The 50-year time frame was used in order to compare the options over the same performance period.

companies. During this event, the Air Force presented the enhanced-use lease opportunity, provided a tour of the power plant, and accepted questions from participants. The questions and the Air Force's answers to those questions were subsequently posted on the website of the consulting firm the Air Force contracted with to support its execution of the enhanced-use lease project.

- **Prepared a statement of need just prior to Industry Day.** The playbook indicates that the statement of need is to be revised based on feedback received during Industry Day or updates required from answers provided as part of a question-and-answer document.
- **Posted a final request for qualifications** on the Federal Business Opportunities website.²⁵ The playbook indicates that the final request for qualifications is to be released within 3 weeks after Industry Day, to maintain interest and momentum from the event. It further notes that the response period is typically 6 weeks. The Air Force posted its request for qualifications on October 12, 2012, over 9 weeks after Industry Day. The deadline for proposals was December 7, 2012, or approximately 8 weeks later. The guidance also suggests that additional time may be given for more complicated projects, and Air Force officials told us they wanted to give potential lessees additional time to prepare their proposals.

The Air Force did not get beyond these steps in the enhanced-use lease process because it did not receive any proposals.

Air Force Instruction and Manual

Air Force guidance on economic and business-case analyses provides information on developing cost estimates for certain projects.²⁶ Air Force guidance for economic analyses identifies circumstances under which an economic analysis is required, including new projects when total investment costs equal or exceed \$2 million (in fiscal year 2011 constant dollars) and for any utilities privatization project.²⁷ It further lays out special instructions for energy projects, which are to be evaluated in

²⁵The final request for qualifications was generally a finalized and slightly longer version of the statement of need.

²⁶Air Force officials identified this guidance as relevant to their analyses, and it was used as part of the study development.

²⁷Air Force, *Economic Analysis*, Instruction 65-501 (Aug. 29, 2011).

constant dollars and to use Department of Energy indices, which are published annually, for energy prices. Further, in the case of lease-purchase decisions and private sector-financed leases or service contracts involving energy projects, Energy Conservation Investment Program projects are to have a simple payback of 10 years or fewer and a minimum savings-to-investment ratio of 1.25 to meet DOD criteria.²⁸ The Air Force guidance for business-case analyses describes such an analysis as a decision-support document that identifies alternatives and presents convincing business, economic, risk, and technical arguments for selection and implementation to achieve stated organization objectives or imperatives. Among other things, the benefits and total costs to the government should be developed over the full life cycle of the project for each alternative, and they should address the status quo. The guidance also notes that, for enhanced-use leases, these analyses focus on identifying the highest and best use for the fair market value of the asset and presenting the business, economic, and technical arguments in support of the project.²⁹ Reviewing the Air Force's feasibility study, we found that the Air Force generally followed this guidance. Specifically, we found the following:

- For each of the five options presented in the feasibility study, the Air Force included estimated costs and a comparison of those costs against each of the others and against the costs of continuing to operate the plant.³⁰ Table 1 summarizes the total estimated costs for each of the five options presented in the feasibility study and for the status quo as well as the estimated cost savings to the Air Force for each of the options compared to the status quo.

²⁸The savings-to-investment ratio is the dollar amount saved per dollar invested, and it evaluates the financial benefits of a project in comparison to the investment over the life of the project.

²⁹Air Force, *Business Case Analysis Procedures*, Manual 65-510 (Sept. 22, 2008) (certified current Oct. 19, 2010). Air Force Manual 65-510 identifies enhanced-use leasing as a scenario that may require unique formats or modifications to the business-case analysis outline presented in the guidance. Air Force officials noted that they used this manual as guidance for developing the feasibility study for Clear Air Force Station.

³⁰The five options presented in the feasibility study were for the Air Force to (1) replace the plant with a plant sized at 8 megawatts, *without* grid connection; (2) replace the plant with a plant sized at 8 megawatts and sell excess power, *with* grid connection; (3) lease the plant to a private entity; (4) privatize the plant; and (5) close the plant. These options are discussed in more detail on pages 28-42.

Table 1: Comparative Costs of Power Plant Options from Feasibility Study

Power plant option	Estimated cost (2010 dollars)	Cost savings to Air Force compared to the status quo (2010 dollars) ^a	Percent cost savings to Air Force compared to the status quo
Status quo ^b	\$506,919,000	\$NA	NA
Option 1: 8 megawatt plant without grid connection	416,745,000	90,174,000	17.8
Option 2: 8 megawatt plant with grid connection	416,910,000	90,009,000	17.8
Option 3: Enhanced-use lease	266,982,000	239,937,000	47.3
Option 4: Privatization	266,113,000	240,806,000	47.5
Option 5: Closure	238,496,000	268,423,000	53.0

Source: Air Force.

NA = Not applicable

Note: Data are from the November 2010 feasibility study.

^aThe savings are calculated over a 50-year period.

^bThe status quo includes continued operation of the facility as it has been run, including the redundant operation of two boilers.

- Estimated costs for each option were laid out in different broad categories, including operation and maintenance and repair and replacement of existing assets, among others. Further, these categories varied based on the characteristics of the option being described. For example, the first option involved replacing the current plant, with its capacity of 22.5 megawatts, with a smaller, 8-megawatt plant that would not be connected to the grid. Thus, the description of this option did not include costs for the grid connection and included a reduced estimate for operation and maintenance costs after the smaller plant became operational. Appendix II contains additional information on the estimated costs of the five options in comparison to each other and to the status quo.
- All costs were calculated over a 50-year period because the Air Force considered 50 years to be the expected term of an enhanced-use

lease.³¹ Estimates were expressed in 2010 dollars to provide the same present value across all options.³²

The feasibility study used a standard figure for the cost to purchase power under the enhanced-use lease and utilities privatization options and included a separate amount for the cost to purchase steam for heat. However, the option to close the plant included only the costs for purchasing power and did not clearly account for the costs of fuels to operate the new heat systems. In general, the Air Force projected that power costs would increase but that those increased costs would be offset by decreased capital and labor costs.³³

**Energy Conservation
Investment Program Guidance**

The Air Force submitted the grid connection and heat plant project to OSD in January 2012, as a proposal for funding under the fiscal year 2013 Energy Conservation Investment Program.³⁴ The Energy Conservation Investment Program seeks to fund projects that will produce improvements in energy consumption, cost, management, and security; one of the program's objectives is to dramatically change the energy consumption at individual installations or joint bases. Funds for the program are allocated across four categories of projects: renewable energy, energy conservation, water conservation, and energy security. Proposals are evaluated based on several metrics, including the savings-to-investment ratio and the payback period, among others, and all proposals submitted to OSD must include a life-cycle cost analysis for the proposed project.

³¹The feasibility study also noted that the utilities privatization contracts that were awarded for three Army installations in Alaska—Forts Greely, Richardson, and Wainwright—were all for a 50-year period.

³²In the comparative analysis in the feasibility study, the Air Force used the economic metric net present value to evaluate the five options. Net present value is the sum of all future cash outflows minus inflows, which were discounted to 2010 dollars and calculated over a 50-year period.

³³The economic analyses in the feasibility study assume that electricity expenditures will remain flat over the 50-year time horizon of the analysis, whereas electricity prices for industrial customers in the United States have increased 33 percent over the past 10 years and rates in Alaska have increased 101 percent over the same period.

³⁴The Facilities Energy and Privatization Directorate of the Office of the Deputy Under Secretary of Defense, Installations and Environment (ODUSD [I&E]), which manages this program, issues guidance for the military departments and defense agencies to follow in preparing submissions for funding.

The Air Force submitted the DD Form 1391, *Military Construction Project Data*, and the building life-cycle cost report for its proposed project along with a spreadsheet addressing the data elements requested in program guidance.³⁵ Air Force officials told us that the building life-cycle cost estimate analysis is accepted by OSD and is the only tool the Air Force uses for assessing energy options. We reviewed the original DD Form 1391 that was prepared in January 2012 for the Clear Air Force Station project and submitted with the building life-cycle cost estimate as part of the submission to the Energy Conservation Investment Program. This estimate was subsequently revised in September 2013 as the Air Force refined its cost estimates and prepared to work on the contracts with Golden Valley Electric Association and the U.S. Army Corps of Engineers.³⁶

- **Original Cost Estimate.** The building life-cycle cost estimate in the original DD Form 1391 determined that annual energy costs would increase by \$7.36 million, whereas annual recurring savings in operation and maintenance costs would be approximately \$8.87 million per year. The estimate also identified capital projects valued at approximately \$16.2 million in plant upgrades for the next 5 years, which would be avoided if the plant was decommissioned.³⁷ The savings-to-investment ratio was 8.42, and the payback period was 7.59 years.³⁸ A higher savings-to-investment ratio indicates greater savings in comparison to the investment, and the OSD program manager told us that the Energy Conservation Investment Program funds many projects that have ratios between 1.4 and 2.0. The ratio for this project was significantly greater than the program requirement of 1.25. Also, the payback period was within the requirement of 10 years or fewer.

³⁵DOD uses the DD Form 1391 to support requests for funding for proposed military construction projects.

³⁶Specific information about the Air Force's original and revised total cost estimates for these projects is included in the restricted version of this report.

³⁷Although the costs of power and diesel fuel are shown to be greater than the costs of coal in this projection, these costs are less than the anticipated savings in labor and capital costs.

³⁸Air Force officials told us the initial Energy Conservation Investment Program project submission identified a savings-to-investment ratio of 14.5 due to some errors in electric and heating costs. They said that this figure was later revised to 8.42 and corrected on the OSD website.

- **Revised Cost Estimate.** In the revised DD Form 1391, annual cost savings from reduced operation and maintenance expenditures were estimated to result in a net first-year savings of \$2.68 million. The same capital costs would be avoided. The savings-to-investment ratio was now 3.30 and the payback period was now about 6.62 years. This was a marked drop from the earlier 8.42 savings-to-investment ratio but was still greater than the 1.25 threshold. Additionally, the payback period was well within the requirement of 10 years or less.

We talked to Air Force officials about the reasons for the decrease in expected savings for the grid tie-in and heat plant project in the second estimate. These officials told us that the original DD Form 1391 was based on information that had been collected from the raw steam and electrical output of the plant that is supplied to the composite area. They said that, because the energy is measured at the production point, much of the wasted energy in the generation process was captured in the operation and maintenance costs. According to the officials, the revised DD Form 1391 has more refined costs because an engineering heat analysis that modeled the heat consumption of the composite area buildings was performed in support of the design of the new heat plant. The officials said that the modeled data provided a more accurate picture based on seasonal and peak load conditions and enabled the Air Force to identify more accurate maintenance costs compared to those in the feasibility study.

Another change was in the estimated costs to purchase power from Golden Valley Electric Association. The feasibility study estimated that Clear Air Force Station could purchase electricity at a price of 11.5 cents per kilowatt hour. As of April 2013, this price was estimated to be approximately 13.23 cents per kilowatt hour under the GS-3 industrial rate. Representatives from the union that represents plant personnel had questioned the accuracy of the Golden Valley Electric Association rate used by the Air Force, but Air Force officials told us that the Air Force had confirmed with Golden Valley Electric Association that it would receive the industrial rate, as opposed to the GS-2 commercial rate of almost 16 cents per kilowatt hour. The officials told us that this was because the Air Force, not the public utility, would be responsible for maintenance of the substation and switchgear that will be located on the installation.

For Options Considered in the Feasibility Study, Some Plant-Closure Costs Were Not Fully Developed, but Adding This Information Would Not Have Materially Affected the Outcome

In reviewing the cost estimates for the five options for the plant, we found there were some items and associated costs that were not fully developed in the feasibility study but were later more fully developed as the Air Force took steps to carry out its plans. Air Force guidance on economic analyses indicates that minor costs or costs common to all of the alternatives being considered may be excluded when conducting a preliminary economic analysis.³⁹ However, although the feasibility study presented the option to close the plant as the alternative the Air Force would pursue if it did not receive any proposals for an enhanced-use lease, the study did not fully document all of the expected costs for the plant-closure option. While adding this information is unlikely to have materially affected the Air Force's decision to close the plant, fully developing those costs in the feasibility study would have provided decision makers with more complete information and a better understanding of the proposed actions. Although some cost details were not available at the time of the feasibility study, having a better description of the sources of costs and what actions the Air Force would need to take to provide a heat system for the composite area would have given decision makers a fuller picture of what the Air Force would need to buy or consider in assessing the costs of this option. In particular, it would have been useful to present an estimate of other associated costs, such as the labor or additional contract costs, over the same period. Two instances where we saw that costs for the plant-closure option were not fully developed were heat system costs and potential labor or contract costs.⁴⁰

Heat System Costs Were Not Fully Developed in Plant-Closure Option

The analysis for the plant-closure option included a placeholder for a heat system with estimated costs of almost \$13 million (in 2010 dollars) for boilers to heat the buildings. However, the feasibility study stated only that the buildings could be converted to electric heat, or the Air Force would buy and install package steam generators in 2015 to supply steam

³⁹Air Force, *Economic Analysis*, Manual 65-506 (Aug. 29, 2011). For example, all of the options except for the option to close the plant require the purchase of coal to operate the plant. In some cases, this is a direct cost; in other cases, it is an indirect cost related to the purchase of power and heat from a new owner or lessee.

⁴⁰There were some other areas where the Air Force did not provide details, such as the costs for operating and maintaining the transmission equipment and substation. These minor costs would be directly associated with the option for an 8-megawatt plant that is connected to the grid and the option to close the plant. These costs would potentially be included in the costs of power to the Air Force under the enhanced-use lease and utilities privatization options.

to the buildings. The information in the study did not specify the types of systems that the Air Force anticipated using, nor did it provide information on the source of the \$13 million estimated cost. Further, there are likely to be other costs associated with the heat system, such as diesel storage tanks, possible modifications to the existing buildings to accept a different method of receiving heat, and a means of protecting existing water and sewage pipes that are currently kept warm by their proximity to the steam lines; these other costs were not presented in the study. Additionally, boilers have a shorter life span than a power plant. The Air Force's revised building life-cycle cost estimate included a life cycle of approximately 20 years, which is OSD's estimated economic life cycle for boilers. As a result, the Air Force would likely have to replace the boilers at least twice during the 50-year period covered by the plant-closure option. The Air Force's estimated cost for the boilers in 2015 was \$15 million. Applying this estimate to replacement boilers in years 26 and 46 would require an additional \$7.6 million and \$4.5 million, respectively, in 2010 dollars. We determined, and Air Force officials acknowledged, that this would result in a total increase of \$12.1 million for this option, which would still be less costly than the status quo.

Plant-Closure Option Did Not Include Labor or Contract Costs

The plant-closure option assumed that the plant would be closed after 2015 and that starting in 2016 there would be no operation and maintenance or general and administrative costs. However, there would still be some remaining costs for continuing to provide heat to the base, and they are not included in the estimate for the plant-closure option. The plant-closure option accounts for savings in labor costs, since the existing plant personnel would no longer be needed once the plant is decommissioned. While these costs would no longer be associated with operating and maintaining the plant, there would likely be some personnel costs incurred for this option. The plant currently provides both power and heat to the composite area, and connecting to the grid and purchasing electricity from Golden Valley Electric Association addresses only the provision of power. As described above, the Air Force will be installing heat systems for the composite area, which will require personnel to operate and maintain them. Air Force officials told us that operating the heat boilers could require two to eight personnel, depending on the number, type, and size of the heat system that is developed. If operations and maintenance were provided by the current base operating support contractor, then the contractor would likely require additional funding in order to assure this coverage. The Air Force would incur these costs either as labor costs or as increases in the base operating support contract.

Air Force officials told us that they initially were considering a centralized steam plant with a high-pressure system—which would have required two operators at a time for 24 hours a day, 7 days a week—and that the Air Force would have likely retained civilian plant employees for this work. According to the officials, if the Air Force had pursued this higher-pressure option, which they said had been considered during the evaluation of heat plant options, it would have required eight dedicated plant personnel. The officials said that they would likely have retained some Air Force civilian employees, but about 75 percent fewer employees than the 34 positions identified in the feasibility study.⁴¹ The status quo estimate calculates the labor costs, which are part of the operation and maintenance costs, to be approximately \$4.3 million per year in 2010 dollars. If almost one-fourth of the labor costs are added back into the model for 2016 and beyond, this will result in an increase of almost \$22.5 million in this estimate (in 2010 dollars). Since the initial discussions, the Air Force has moved away from the high-pressure system and is now considering a medium-pressure heat source. Air Force officials told us that they now anticipate having the base operating support contractor operate and maintain the boilers. They estimated that funding this item will require approximately \$257,000 per year above the existing contract, which would include labor, equipment, and supply components. We calculated that adding these contract costs to the estimate each year would have added an additional \$5.7 million in 2010 dollars over the 50-year period, which would still make it less costly than the status quo.

Omissions Were Unlikely to Have Materially Affected the Air Force's Decision

Despite these omissions, we found that the differences in the plant-closure cost estimate were unlikely to have materially affected the Air Force's decision to close the plant. Specifically, the costs of all of the options where the plant remained open under Air Force operation were significantly higher than the costs of the option where the plant would be closed, even accounting for the omissions discussed above. There were some items that could have been more fully documented and included in the plant-closure option, particularly since this was the option the study recommended be pursued if the enhanced-use lease proposal were unsuccessful. However, while including those items that were omitted

⁴¹As of December 2013, the power plant had 32 permanent billets. Officials at Clear Air Force Station told us that the plant was currently staffed at 19 personnel. Because of personnel shortages, an additional 6 military personnel are on temporary duty to the installation on 4- to 6-month rotations to assist the permanent staff.

could have been helpful for decision makers and for clearly documenting differences between the options, the differences in those dollar amounts were unlikely to have materially affected the determination of overall savings compared to the status quo option. Regarding the heat boilers, for example, the Air Force has since refined its cost estimates as part of the building life-cycle cost estimates developed for the submission to the Energy Conservation Investment Program. The latest cost estimate for purchasing the boilers is now less than half of the amount estimated in the feasibility study.⁴² Further, the labor costs for 8 personnel would still be approximately 75 percent lower than the labor cost used in the feasibility study, which was for 34 personnel. Instead, the Air Force could face approximately \$250,000 per year in labor and related costs. Even the original boiler estimate falls far below the estimated status quo cost. That is, the original boiler estimate—with two replacements over the period covered by the feasibility study, plus eight civilian positions to run a centralized heat plant—would have brought the estimated cost for the plant-closure option to about \$273 million (in 2010 dollars), versus estimated status quo costs of almost \$507 million over the same 50-year period.

Several Noneconomic Goals Significantly Influenced the Air Force's Decision Concerning the Power Plant

The Air Force identified goals other than cost savings in relation to the power plant at Clear Air Force Station. Specifically, in addition to its economic analyses of various power plant alternatives and the subsequent elimination of some options, the Air Force also considered other factors when making its decision regarding the future of the plant. These included the

- Air Force goal of no longer operating and maintaining the plant because the Air Force does not consider power generation to be a core competency,
- Air Force goal of reducing energy costs at Clear Air Force Station, and
- Air Force need to ensure reliable power for current and future mission-critical facilities and supporting facilities.

⁴²The Air Force's current cost estimate to purchase the boilers is included in the restricted version of this report.

Air Force Goal of No Longer
Being Responsible for
Operating and Maintaining the
Plant

Taken together, these factors and the Air Force's analyses formed the basis for the Air Force's decision to close the plant once the grid connection, heat systems, and backup power sources are operational. These factors and their effect on the Air Force's decision are discussed below.

Air Force Goal of Reducing
Energy Costs at Clear Air
Force Station

In the feasibility study, the Air Force indicated that one constraint for the study was that both Air Force Space Command and Clear Air Force Station stipulated that the Air Force did not wish to become a de facto utility with the assumption of resultant roles, responsibilities, and risks. To that end, the study stated that relieving the Air Force of the responsibility for operating and maintaining the plant was a primary test for determining an optimal alternative operating model for the plant. Of the five options presented in the feasibility study, the Air Force concluded that options 3 (lease) and 4 (privatize the plant) met this test. Options 1 (smaller plant with no grid connection) and 2 (smaller plant with grid connection), on the other hand, did not meet this test, since the Air Force would continue to operate and maintain a plant at Clear Air Force Station under those scenarios, as well as under the status quo option. In option 5, the plant would close so that no entity would be operating and maintaining a plant on the installation. Air Force officials told us that power plant maintenance and operations are not core competencies for the service, and the Air Force is seeking to move away from operating power-production facilities worldwide.

The feasibility study highlighted that the Air Force was looking for ways to reduce the energy costs at Clear Air Force Station. As described earlier, the installation has an energy intensity, or energy consumption per square foot of building space, that is approximately seven times the average for Air Force Space Command installations, and its cost per square foot is about double that of the average for the command. Officials from Air Force Space Command and the Air Force Civil Engineer Center told us that the Air Force has a service-wide goal of reducing its energy intensity by 37.5 percent by 2020, and they explained how the plant at Clear Air Force Station fits into those larger energy goals. Within Air Force Space Command, the 21st Wing is seeking facilities energy reductions for its seven installations that report on energy. The energy-reduction project at Clear Air Force Station is a command priority, and the 21st Wing determined that connecting the installation to the grid will contribute greatly to the wing meeting its energy-efficiency goals. In Air Force Space Command's estimate, eliminating on-site energy generation at Clear Air Force Station will reduce the installation's annual energy

Air Force Need to Ensure Reliable Power for Current Mission

consumption by about 85 percent, from approximately 800 million BTUs to 123 million BTUs.

According to the Air Force Space Command instruction regarding utility reliability requirements in place at the time of the feasibility study, the missile warning radar system for Clear Air Force Station, Alaska, required 0.9999 annual utility availability, or 99.99 percent. This translated to a downtime of 53 minutes a year.⁴³ The 2010 feasibility study stated that, in 2009, Golden Valley Electric Association's system had a reliability of 99.99 percent, experiencing about 10 to 20 minutes of outages. The study assessed that Golden Valley Electric Association's minimal system outages and the possibility that Clear Air Force Station could negotiate uninterruptible service with the utility would mean that Golden Valley Electric Association would likely serve as a reliable backup power source.⁴⁴ Officials stated that DOD's reliability standards apply solely to mission-critical facilities, and the radar is the only mission-critical facility at Clear Air Force Station. Therefore, according to these officials, reliability standards apply only to the radar and not to the composite area or the rest of the installation. Air Force officials explained that the new emergency power plant for the radar mission, which had been under construction at the time of the feasibility study, had since been completed and that it would provide the required backup power and heat for the radar mission. With both the emergency power plant and a connection to the grid, the radar could shift from the plant to the grid to acquire the electricity needed to provide power and heat to the radar facility. In our discussions with Air Force officials, we learned that the power plant had experienced two outages a few months earlier—the first outages in more

⁴³See Air Force Space Command, *Utility Outage and Incident Reporting*, Air Force Space Command Instruction (AFSPCI) 32-1010 (Nov. 1, 2004). According to officials, this instruction was rescinded in May 2012. In 2010, the feasibility study—indirectly citing this instruction—stated that, to meet mission-critical objectives, the power plant was to maintain at least 99.99999 percent capability, translating to a downtime not to exceed 5.3 minutes per year. However, at that time, AFSPCI 32-1010 stated that the utility reliability requirement for missile warning radar systems, including the system at Clear Air Force Station, Alaska, was 0.9999 percent annual utility availability, which equated to an annual downtime of 53 minutes per year. This requirement equaled the 2009 reliability of Golden Valley Electric Association.

⁴⁴The feasibility study discussed that Clear Air Force Station would need to negotiate an uninterruptible service with Golden Valley Electric Association that is acceptable, meaning that its service would not be interrupted at times of seasonal peak load by direct control of the utility system operator or by the customer's action at the request of the system operator.

than 16 years—highlighting the age and condition of the plant and the importance of backup power for the radar mission. Air Force and Missile Defense Agency officials also described upcoming projects to expand the emergency power plant capabilities by installing a third generator.

Additional diesel storage tanks will also be constructed to ensure that additional fuel resources are on-site near the radar facility and available to support backup power generation.

Although it is not considered mission-critical, the composite area also requires a reliable source of power and heat, due to the extreme temperatures that could quickly damage facilities and utility systems in the event of a power outage. Air Force officials told us that the planned 1-megawatt backup generator will provide the minimal power needed for the heat plants and electricity for the composite area if the installation loses grid power. They further stated that the tie-in to the electric grid will be configured in such a way that power could be brought in from a different direction should there be problems somewhere along the Golden Valley Electric Association transmission line. For example, if there is a power outage south of the installation that affects the Golden Valley Electric Association transmission line, power could be brought in from the north, and vice versa.

Air Force Need to Ensure Reliable Power for Future Missions

The Air Force and the Missile Defense Agency have planned radar upgrades for Clear Air Force Station in the near future, but the Air Force has determined that these upgrades are not likely to have significant effects on Clear Air Force Station's energy requirements. Since changes to the radar in 2001 had resulted in the significant reduction in power requirements for Clear Air Force Station, we discussed with appropriate Air Force and Missile Defense Agency officials the potential impact of these planned changes on the installation's energy requirements and what confidence the Air Force had that the planned capability at the installation would be sufficient to support any adjusted energy requirements. In the feasibility study, the Air Force addressed the potential effects of the radar upgrades on Clear Air Force Station's energy demand, stating that the new radar system was expected to consume an amount of power roughly equal to the power currently being shed to the load bank, which would result in no appreciable increase in electricity demand. As stated previously, energy demand at Clear Air Force Station ranges from 3 to 6 megawatts, and the power delivered to the load bank ranges from approximately 100 kilowatts in the winter to 1,000 kilowatts in the summer.

Air Force Space Command officials summarized their assessment of the effect of the radar upgrade on energy requirements. According to these officials, there are two pending Missile Defense Agency projects that will influence the energy load and cost calculations at Clear Air Force Station. Of these projects, one was previously assessed as potentially requiring a temporary load increase during implementation and simultaneous operation but not a net increase in consumption once the transition is complete. For the other project, the Air Force did not have load figures but assessed that the project would not greatly increase the energy demand at Clear Air Force Station. In addition, the officials addressed the potential effects on energy demand of three other upcoming military construction projects at Clear Air Force Station. They told us that the Air Force had concluded that, overall, there would not be a net increase in energy demand, due in part to more energy-efficient construction.

The Air Force Considered Several Alternatives to Closing the Power Plant but Did Not Find Them to Be Economical, and Some Options Were Not Fully Evaluated

The Air Force considered and evaluated several options before selecting the option to close the plant after first connecting to the local grid and building a separate heat system. Officials said that they obtained ideas for the options they considered from stakeholders, including Clear Air Force Station, 21st Space Wing, and power plant employees, and fully evaluated some of the options that looked more promising. Still other options were considered but were not fully evaluated in formal studies because they did not generate as much savings or the Air Force did not consider them to be economically feasible. For example, the Air Force did not fully assess the costs of more incremental changes to current operations of the existing plant, such as retaining ownership of the plant but downscaling its operations, because extensive capital improvement costs would remain (although the costs of coal would be reduced). Among the options that it considered, the Air Force found that some options did not generate as much savings as other options and that some were not feasible from the Air Force's perspective because the technical, practical, and mission challenges were viewed as too difficult to overcome. The Air Force pursued the option to solicit an outside entity to assume the plant's operations and maintenance through an enhanced-use lease, but no outside entity ultimately submitted a proposal in response to the Air Force's solicitation. Finally, as the U.S. Army Corps of Engineers further developed studies on the designs of the heat systems,

various technical issues emerged, leading to changes in the design of the heat system.⁴⁵

The Air Force Determined That Some Alternatives to Closing the Power Plant Were Not Economical

The Air Force began to consider what it should do with the power plant at Clear Air Force Station after it had identified the plant as operating inefficiently. As noted earlier, the 21st Space Wing had been looking at ways to improve efficiency and cut costs for the Clear Air Force Station power plant as far back as the 1990s, but Air Force Space Command believed that it was unable to pursue major changes until after emergency backup power for the installation's mission was ensured. For this reason, the 21st Space Wing did not formally program any requirements prior to 2008 that would have led them to seek funding for such projects. In August 2009, the Air Force Real Property Agency prepared a briefing that referenced a 2008 concept opportunity study that identified the plant as underutilized and identified opportunities and challenges associated with an enhanced-use lease for the plant. For example, the briefing identified potential environmental review as a challenge that might undermine the value of the plant for a potential lessee. The same briefing discussed the establishment of a working group to conduct an opportunity analysis for the plant. In the same month, officials from Air Force Space Command, the 21st Civil Engineering Squadron, the Air Force Real Property Agency, and the Air Force Civil Engineer Support Agency met to discuss opportunities for utilities privatization or an enhanced-use lease of the plant. The meeting attendees discussed potential interest from Golden Valley Electric Association to acquire the plant's excess energy and agreed to conduct a prefeasibility study to compare available options in order to determine the best approach for the power situation at Clear Air Force Station. The Air Force then prepared a draft concept opportunity study in June 2010, as a precursor to the feasibility study. The concept opportunity study was a qualitative study that identified strengths, weaknesses, opportunities, and threats for four options as they pertained to energy reliability; environmental requirements; potential for revenues, savings, or energy efficiency for the Air Force; and reductions in non-mission-critical resources and the time involved in plant functions. Three of the options were also studied in the feasibility study, which provided a quantitative comparison of the savings generated for the Air Force by

⁴⁵The heat system for the composite area is a relevant part of the option to close the plant. Backup heat for the installation was also a consideration for the enhanced-use lease option.

each of the five options when compared to the status quo.⁴⁶ Both studies considered the options for the enhanced-use lease, utilities privatization, and selling excess power. The possibility of closing the plant was first raised in the concept opportunity study and was studied further in the feasibility study.

Air Force officials said that economic analyses drove the decision they made regarding the power plant and determined that some options were not economical because they did not generate as much savings for the Air Force. The concept opportunity study stated that the Air Force continuing to own and operate the plant would not be advantageous because the plant would continue to produce energy in excess of requirements, using old equipment. These officials said the feasibility study indicated that it would be cost-prohibitive to update the existing plant. The feasibility study estimated the costs for updating the existing plant in the near term as about \$21 million. Those costs include items such as installing a new combustion-control system and replacing a boiler tube. Additionally, plant employees told us that, due to the age of the plant, replacement parts for plant equipment and controls have become difficult to find. The feasibility study found that options for the Air Force to operate a smaller replacement plant, with or without selling excess power from this smaller plant, would not generate as much savings for the Air Force as certain other options. The feasibility study also found that the utilities privatization option would generate slightly greater savings than an enhanced-use lease and that the option to close the plant would generate the most savings for the Air Force compared to the status quo.⁴⁷ The feasibility study concluded that the Air Force should pursue the enhanced-use lease in order to obtain realistic valuations of the plant from potential lessees, or, if the lease project were unsuccessful, close the plant. Table 2 provides a summary of several of the options that the Air Force considered. The details of the options considered in either the concept opportunity study or the feasibility study are discussed below.

⁴⁶As noted earlier, the status quo considered in the feasibility study is the cost that the government should expect to pay over the next 50 years to own and operate the plant in the same way as in 2009.

⁴⁷The feasibility study examined two scenarios for utilities privatization to represent the spectrum of expected market responses to a utilities privatization project. The study found that one scenario would generate the second greatest savings as compared to the status quo while the other scenario would result in greater costs than savings.

1. **Replace the current plant with a plant sized at 8 megawatts:** This option was not considered in the concept opportunity study but was included in the feasibility study. Under this scenario, the current plant would be replaced over a 5-year period with a plant sized for the energy demand at the installation at 8 megawatts. This option was shown to generate some savings compared to the status quo in the feasibility study, but not to generate as much savings as the other options.
2. **Connect to the power grid and sell excess power:** In both the concept opportunity study and the feasibility study, the Air Force considered connecting a plant on the installation to the local power grid in order to sell the excess power it would generate. The concept opportunity study considered the option for the existing plant to produce power in excess of mission requirements and sell the excess power through the grid connection. The study concluded that, in order for power sales to be economical, the plant would likely need to operate at its full 22.5-megawatt capacity. Under this scenario in the feasibility study, the Air Force would replace the existing plant with a plant sized at 8 megawatts and sell any excess power to a utility or another military base in Alaska. The feasibility study found that this option generated lower savings than other options and that revenues generated from the smaller plant would not cover the cost of the connection to the grid, because there would not be as much power in excess of the installation's needs available for sale. Furthermore, there were some complications associated with operating the plant at its full 22.5-megawatt capacity:
 - As previously stated, the Air Force currently does not operate the plant at full capacity in order to avoid having it classified as a major source for hazardous air pollutants. According to Air Force officials, increasing power production at the current plant would also require them to install new combustion and emission monitoring controls and to consider changes to the air quality control operating permit. Officials additionally said that an environmental analysis associated with obtaining a new permit would also be required, and that permit would take 2 to 3 years to obtain.
 - Air Force officials indicated that the Air Force would not be able to sell power to private entities and that selling power to a public

utility or other government entities was not economically viable.⁴⁸ They also said that, if the Air Force sold power to other government entities, such as Army bases in Alaska, it would still incur the costs of capital improvements to the plant but would not be reimbursed for that investment. In addition, they said that they had considered selling excess power to the Army but determined that this option would not have been economical for the Army because the Army could buy any additional power it might need at a cheaper rate from the local public utility.

3. **Lease the plant to a private entity or public utility through an enhanced-use lease:** This option was considered in both the concept opportunity study and the feasibility study. Under this scenario in the concept opportunity study, the Air Force would negotiate with the lessee to purchase power and steam. The concept opportunity study recommended moving forward with a quantitative evaluation, or business-case analysis, of the enhanced-use lease option. Under this scenario in the feasibility study, the Air Force would pay for the connection from the existing plant to the grid and would negotiate a power and steam purchase agreement with the lessee. Additionally, the lessee would sell power to the market over the grid. The feasibility study makes the assumption that the lessee would replace the plant at a capacity of 22.5 megawatts and that the Air Force would reimburse the lessee for capital upgrades to the plant, while the revenue that the lessee generated through power sales would be deducted from the amount the Air Force would pay the lessee for the capital upgrades. The feasibility study found the enhanced-use lease to be the option that generated the third greatest savings among the options that were evaluated, close to the savings generated for one of the scenarios for utilities privatization. In February 2011, officials from the Air Force Real Property Agency briefed the Privatization Executive Steering Group and the Basing Requirement Review Panel, both of which concurred with the recommendation to pursue an enhanced-use lease.

⁴⁸Air Force Instruction 32-1061 states that the installation commander may sell utilities and related services to a nonfederal organization on or in the immediate vicinity of an Air Force installation if, among other requirements, the sale serves the interest of national defense or the public interest and service is not available from local private or public suppliers. Air Force, *Providing Utilities to U.S. Air Force Installations*, Instruction 32-1061, para. 4.2 (Feb. 23, 2011).

4. **Privatize the plant:** This option was also considered in both the concept opportunity study and the feasibility study. Under this option in the concept opportunity study, the Air Force would sell the existing plant to a third party and negotiate a power and steam purchase agreement with the new owner. The Air Force evaluated two scenarios under this option in the feasibility study. Under both scenarios, the Air Force would pay for the connection from the plant to the grid, and the new owner would replace the plant up front (by 2020) at a capacity of 22.5 megawatts. As in the enhanced-use lease option, the Air Force would reimburse the new owner for plant upgrades, and the new owner would sell power to the Air Force and to the market over the grid. Revenue generated by the plant owner would be deducted from the amount the Air Force would reimburse the new owner for capital upgrades. In one scenario, the Air Force would pay its share of the owner's capital investment; in the second scenario, the Air Force would compensate the owner for all of the capital investments. While the first scenario would generate some savings to the Air Force, the second scenario would generate costs rather than savings.⁴⁹

The concept opportunity study identified several advantages that an enhanced-use lease would have over utilities privatization. For example, under the enhanced-use lease, the Air Force would have more flexibility to revert the equipment and operations back to Air Force control and, if desired, to purchase power through a grid interconnection in the future. According to this study, an enhanced-use lease could also better accommodate changes in mission requirements, energy pricing, and utility and environmental regulations. The feasibility study identified similar issues for consideration for both the enhanced-use lease and utilities privatization options, including that for either option to be attractive to an outside entity, a major upgrade of equipment would likely be required to enable the lessee or new owner to maximize the amount of excess power it could sell on the grid.

⁴⁹Under one scenario, the Air Force would pay its share of the owner's capital investment in proportion to the Air Force's share of the load from the power plant. The Air Force would make a onetime payment and the residual value of the plant would be deducted from the amount the Air Force pays the new owner. In the second scenario, the Air Force would make annual payments to the new owner to compensate for all of the capital investment, and the new owner would pay the Air Force the fair market value of the plant amortized over a 15-year period at an interest rate of 5.5 percent.

5. **Close the plant:** The concept opportunity study raised the possibility of connecting to the local power grid as the installation's sole source of power, with backup diesel generators for power, and briefly identified some issues to take into account were the Air Force to consider this option. Under this option in the feasibility study, the Air Force would build the connection to the grid, install power and steam backup systems, purchase power from Golden Valley Electric Association, and shut down the plant. The costs associated with this option include approximately \$22 million (in 2010 dollars) to decommission the existing plant. The option to close the plant generated the most savings for the Air Force compared to the other options considered in the feasibility study.

The Air Force Did Not Fully Evaluate Some Options

Air Force officials said that other options were discussed but were not formally evaluated and documented in studies. For example, officials told us that they considered connecting to the local grid and then running the plant seasonally or running the plant to failure, that is, performing maintenance as needed but not making any major upgrades to extend the life of the plant. Some plant employees said they believed that the most efficient way to run the plant would be to run one boiler and one turbine generator instead of two and investing in the plant to continue its operation, for example by upgrading its combustion controls. In the scenario envisioned by plant employees, the plant would provide primary power and heat to the installation. But the installation could still establish a connection to the local grid for sale of electricity and install a separate heat system as backup power and heat for nonradar areas.⁵⁰ Plant employees believed that operating the plant would be less expensive under this scenario. Air Force officials said that they had considered running only one boiler and one turbine generator and had run the plant this way in the summer of 2012 as part of a study on ways to cut utility costs. They said that this option would reduce the costs of coal but would still require the Air Force to invest in extensive capital improvements to the plant and be responsible for the environmental liabilities of operating the plant. The Air Force did not fully assess the costs of this option, including its effects on labor and maintenance costs, for these reasons.

⁵⁰As previously mentioned, backup power and heat for the radar area are provided by the emergency power plant.

Since the Air Force began considering alternatives to its current operation of the power plant, it has taken steps to improve the reliability of its energy supplies. In particular, the availability of backup power generation and heat for the radar and related facilities and for the composite area means that the only service provided by the existing power plant that does not have an independent backup supply is the heating for the composite area. In the feasibility study, the Air Force did not formally evaluate the feasibility or cost of installing boilers to provide heat to the composite area as a backup to the existing plant because, as stated earlier, this study focused on those options that the Air Force considered to be economically feasible. Rather, boilers to provide heat for the composite area were considered only under the option to close the plant. However, as part of developing the enhanced-use lease project, the Air Force has subsequently taken steps to acquire a backup heat system, which is discussed later in this report. Table 2 provides a summary of several of the options that the Air Force considered.

Table 2: Summary of Options Considered by the Air Force

	Status quo	Feasibility study options					Other possible options	
		Option 1 Replace with 8-megawatt plant, without grid connection	Option 2 Replace with 8-megawatt plant with grid connection	Option 3 ^a Enhanced-use lease	Option 4 ^b Privatize plant	Option 5 ^c Close the plant	Run one boiler and one turbine generator ^d	Run plant at full capacity (22.5 megawatt) ^e
Source of options	Feasibility study	Feasibility study	Feasibility study	Feasibility study	Feasibility study	Feasibility study	Plant employees	Concept opportunity study
Plant owned and operated by	Air Force	Air Force	Air Force	Air Force-owned, lessee-operated	New owner	None	Air Force	Air Force
Plant configuration	Status quo	Replaced at 8 megawatt by Air Force	Replaced at 8 megawatt by Air Force	Replaced at 22.5 megawatt by lessee	Replaced at 22.5 megawatt by new owner	None	One boiler and one turbine generator	Status quo
Operation & maintenance and general & administrative costs ^f	Paid by Air Force	Paid by Air Force	Paid by Air Force	Paid by Air Force until the lease begins	Paid by Air Force until plant sale	Paid by Air Force until plant closure	Paid by Air Force	Paid by Air Force

Status		Feasibility study options					Other possible options	
Repair and replace equipment ^g	Paid by Air Force	Paid by Air Force	Paid by Air Force	Paid by Air Force initially	Paid by Air Force initially	None	Paid by Air Force	Paid by Air Force
Correct initial system deficiencies ^h	Paid by Air Force	Paid by Air Force	Paid by Air Force	Paid by Air Force	Paid by Air Force	None	Paid by Air Force	Paid by Air Force
Grid connection ⁱ	None	None	Paid by Air Force	Paid by Air Force	Negotiable with owner	Paid by Air Force	Paid by Air Force	Paid by Air Force
Source of power and steam ^j	Power plant	Power plant	Power plant	Negotiable with lessee	Negotiable with owner	Local utility	Power plant	Power plant
Electricity sale ^k	None	None	Sold by Air Force	Sold by lessee	Sold by owner	None	Sold by Air Force	Sold by Air Force
Air Force conclusions	Compared to other options in feasibility study	17.8 % in Air Force savings	17.8 % in Air Force savings	47.3% in Air Force savings	47.5% in Air Force savings	53% in Air Force savings	Option would not decrease major costs	Not economical

Source: GAO analysis of Air Force information.

Notes: All options considered in the feasibility study were based on assumptions made about net present value calculated over a 50-year period, and all assumptions made in options 1 through 5 are from the perspective of the Air Force.

^aIn option 3, the Air Force made the assumption that it would make payments to the lessee as fair compensation for capital investments made by the lessee. The assumptions for the enhanced-use lease were further developed and differed in the request for qualifications issued by the Air Force as the Air Force pursued this option. Negotiations with the highest-ranked offeror would ultimately determine various aspects of the arrangement, such as a connection from the plant to the grid.

^bThe Air Force considered two scenarios for option 4—options 4A and 4B. While option 4A generated 47.5 percent in savings as compared to the status quo, option 4B generated 109.3 percent more in costs than the status quo. These two scenarios are combined for the purpose of this table. While most assumptions under both options were the same, the Air Force assumed that (1) the Air Force would pay a share of the capital investment under 4A, but all of the capital investment under 4B; (2) the Air Force would receive profits from the new owner from power sales under 4A but not 4B; and (3) it would receive payment from the new owner for the plant purchase under 4B but not under 4A.

^cUnder option 5, the Air Force included the assumed costs for package boilers that would provide heat to the installation and to decommission the plant.

^dThe option to run one boiler and one turbine generator combines two options. The two options are the same with the exception that, in the first option, the transformer would be capable of delivering 8 megawatts of power to the grid while in the second option the transformer would be capable of potentially delivering 20+ megawatts to the grid. The Air Force did not develop an economic analysis for this option because it concluded that this option would not decrease major costs. GAO made the assumption that in continuing to run the plant, the Air Force would incur costs for operation and maintenance; general and administrative; repair and replace equipment; and corrections to initial system deficiencies.

^eThe Air Force did not fully develop an economic analysis for this option because it concluded that it was not economical. GAO made the assumption that in continuing to run the plant, the Air Force would incur costs for operation and maintenance; general and administrative; repair and replace equipment; and corrections to initial system deficiencies.

^fOperation and maintenance costs include labor, fuel, and contracted maintenance services. In options 1 and 2, the Air Force assumed that it would pay operation and maintenance and general and administrative costs for all of the 50-year period. In options 3, 4, and 5, the Air Force assumed that that it would pay these costs until the plant was leased, sold, or closed in 2016.

^gRepair and replace equipment also includes the repair of railroad tracks, locomotive shelter, and well repairs. In options 1 and 2, the Air Force assumed that that it would pay the costs for repair and replacement of equipment for the first 7 years. In options 3, 4, and 5, the Air Force made the assumption that the Air Force would pay the costs for the first 2 years.

^hIn options 1 through 4 in the feasibility study, the Air Force assumed that the costs to correct initial system deficiencies were the same.

ⁱIn four of the five options in the feasibility study, the Air Force assumed that the power plant's electrical distribution system would be connected to the power grid. However, as the Air Force further developed options for the enhanced-use lease and plant closure, the grid connection was changed to a substation on the installation rather than to the plant. In the scenario for option 3 and both scenarios for option 4, although the Air Force included the cost in its analyses, the Air Force also assumed that it would negotiate the payment of the grid connection to the power plant with the lessee or new owner.

^jThe Air Force assumed that options 3, 4A, and 5 would generate costs for power and steam. Under option 3 and both scenarios for option 4, the Air Force assumed that it would negotiate a power and steam purchase agreement with the lessee or new owner.

^kIn option 2, the Air Force assumed that it would make some profit from power sales. In option 3, the Air Force assumed that it could negotiate revenue to the Air Force with the lessee. In both scenarios for option 4, the Air Force assumed that no revenue would be generated for the Air Force.

The Air Force Pursued an Enhanced-Use Lease but Did Not Receive Proposals

Although the results of the feasibility study showed that closing the plant would generate greater cost savings for the Air Force than an enhanced-use lease, the study recommended that the Air Force first pursue the enhanced-use lease. The study stated that the cost for a lessee to implement capital investments in the plant could possibly be lower than the estimates provided in the study and that the lessee might be able to capture revenue and increase the market value of the plant. Air Force officials said the Air Force pursued the enhanced-use lease in order to leverage industry knowledge and resources and seek creative solutions for keeping the plant open. One Air Force official said that proposals for the enhanced-use lease could have varied by offeror and led the Air Force in different directions than what was envisioned for the enhanced-use lease in the feasibility study. Additionally, negotiations with the highest-ranked offeror would have determined the final terms and conditions of the enhanced-use lease.

As noted earlier, the Air Force released a statement of need in August 2012 to notify interested parties of the enhanced-use lease opportunity, and it held an Industry Day. The companies and public utility that participated in the Industry Day had an opportunity to ask questions, and officials from two of the entities we spoke with said that they had requested and been provided a separate tour of the plant. In October 2012, the Air Force released its final request for qualifications, in which it indicated that the lease would begin after the Air Force completed the project to provide a new heat plant and connect the installation to the power grid. Additionally, the document stated that the Air Force did not

plan to incur additional expenses to maintain the plant after the completion of this project.

Between the conclusion of the feasibility study in 2010 and the release of the statement of need in 2012, the Air Force's plans for the enhanced-use lease changed due to several factors:

- At the conclusion of the feasibility study and as the Air Force began to develop the enhanced-use lease option, the Air Force intended to connect the plant's electrical distribution system to the power grid and enter into an agreement with a lessee to obtain both power and steam for heat. Officials said that connecting the plant to the power grid would make the plant economically viable to the lessee, which might then be able to sell electricity to other customers through the power grid. The Air Force also intended to discuss recouping the cost of the connection from the lessee through the lease negotiation process.
- When the enhanced-use lease project was approved within the Air Force and sent to OSD for review, OSD determined that the project did not meet the conditions for an enhanced-use lease because a heat plant was not considered and the plant would still be needed for "public use" until the connection to the power grid was made.⁵¹ As a result of this review, the Air Force expanded the scope of its project to include a heating system and a backup generator. Additionally, the transmission line would now be connected to a substation on the installation rather than to the power plant's electrical distribution system, as originally considered in the feasibility study. Officials said that this change resulted in a delay of about a year for the enhanced-use lease solicitation process to begin.

The Air Force did not receive any responses to its request for qualifications, and officials said the Air Force determined that receiving no bids on the enhanced-use lease demonstrated that keeping the plant running did not make business sense. We spoke with representatives from two companies and a public utility that had attended Industry Day

⁵¹The Ike Skelton National Defense Authorization Act for Fiscal Year 2011 inserted language in section 2662 of Title 10, U.S. Code, requiring the Secretary of Defense to provide a certification for certain proposed leases involving projects related to energy production. See 10 U.S.C. § 2662(b)(2)(G) (added by Pub. L. No. 111-383, § 2811(e) (2011)). Air Force officials told us that this requirement was not in place when the Air Force made its original decision to move forward with an enhanced-use lease.

and with Air Force officials about possible reasons for this lack of industry interest in pursuing the enhanced-use lease. Among the things they cited were the following:

- **Environmental standards:** Air Force officials and a representative of the public utility we spoke with cited the costs of upgrading the power plant to meet environmental standards as a deterrent. One company's representative said that because the Air Force's energy demand at Clear Air Force Station is only a small percentage of the load capacity of the plant, the lessee would likely have to sell excess power to other customers. However, as discussed previously, if the plant operated at increased capacity, it would potentially be reclassified as a major source for hazardous air pollutants, which might necessitate additional controls and monitoring requirements. The representative for the public utility additionally cited concern with the level at which the plant would be allowed to produce output if a new permit could not be obtained and the length of time associated with obtaining a new permit. A representative from another company also cited the lengthy time associated with obtaining a new permit as a concern. The Air Force believed that a new permit would take 2 to 3 years to obtain.
- **Need for upgrades:** Air Force officials and company representatives said that the plant required major upgrades. A representative from one company we spoke with said that the Air Force would have required the lessee to upgrade the plant to meet government standards but that those standards were unclear in the information that the Air Force provided to potential lessees. A representative from the public utility said that in order for the plant to meet environmental standards, it would need to upgrade the central plant control system. The utility conducted its own assessment of needed plant upgrades and found that additional repairs may be needed.
- **Uncertainty of the plant's profitability:** A representative from the public utility told us that the utility conducted its own assessment of the plant and found that even if the plant could be run at its full capacity after obtaining the necessary environmental permits, production would be more costly than that utility's other power-production alternatives. The utility's assessment also found the estimated cost per megawatt hour would be higher than the utility had expected.
- **Transformer with greater transmission capacity needed:** One company's representative with whom we spoke also cited the transformer's transmission capacity as a potential issue that would

affect the company's ability to sell excess power. The transformer the Air Force planned to buy and place on the installation to receive power from Golden Valley Electric Association did not have the capability to increase the transmission voltage in order to deliver electricity back to the power grid for sale to outside customers. Additionally, since the transmission line as described in the request for qualifications for the enhanced-use lease would not be connected to the power plant, an electrical connection would need to be made between the power plant and the substation on the installation with a transformer capable of increasing the voltage.⁵² Air Force officials said that the Air Force did not want to incur the additional cost of purchasing a transformer that could deliver electricity back to the grid, because a larger capacity transformer would potentially not add value for the Air Force.

- **Competition regarding rates:** One Air Force official and a representative from a company we spoke with said that Golden Valley Electric Association, the local utility, was perceived to have advantages over other companies in negotiating the enhanced-use lease, because the Air Force was already planning to build the transmission line connecting the installation to the power grid operated by Golden Valley Electric Association. Air Force officials said they did not want to commit during Industry Day to buying electricity or steam for heat from any potential lessee but instead told participants to include a power sale offer in their proposals. One company's representative said that he believed the Air Force would opt to buy electricity at the least-cost rate by comparing the rate offered by Golden Valley Electric Association to the rate offered by the lessee. Therefore, any lessee other than Golden Valley Electric Association would have had to compete with Golden Valley Electric Association's rate. This representative also believed that the Air Force would obtain heat from the lessee, because that would be less expensive than potentially using oil-fired generators to heat the composite area. Air Force officials provided a similar assessment.
- **Disposal of coal ash:** One company's representative said that the treatment of the ash produced from the burning of coal was a concern. Due to an Air Force decision not to allow the potential lessee

⁵²Air Force officials identified connection to the grid as something that would be part of negotiations with the selected offeror.

to use the landfill located on the installation that is primarily used for the disposal of the coal ash produced from burning coal, the lessee would have to find a solution offsite. The representative said that, based on the company's operation of other coal plants, finding a solution to the disposal of coal ash is a difficult issue for the company. Air Force officials said that the Air Force's decision was based on concerns about long-term risks and environmental concerns for the Air Force if it were to let the potential lessee use the landfill.

- **Available alternatives to Clear Air Force Station plant:** Air Force officials said that Golden Valley Electric Association had expressed interest in the plant in the past. However, in the interim the utility had proceeded to take the steps necessary to reopen a dormant power plant that would have more than twice the capacity of the Clear Air Force Station plant. The Golden Valley Electric Association representative we spoke with said that the company will invest heavily in capital improvements at that plant and did not know if the risk with the Clear Air Force Station plant would be worthwhile.

Design of Heat Systems Evolved over Time

In the feasibility study, the option to close the plant was the only option that included installing a new heat system. Under the other options considered in the feasibility study, the Air Force made the assumption that it would be able to obtain heat from a replacement plant or from the lessee or new owner. As discussed above, in response to OSD's review of the enhanced-use lease, the Air Force revised its plans to include construction of a new heat system for the installation. As the U.S. Army Corps of Engineers conducted studies to further refine the design of the heat system, various technical issues emerged, leading to changes in the design.

The Air Force first considered building a central heat system for the installation. Officials said that if the enhanced-use lease had succeeded, the Air Force would have negotiated with the lessee to purchase the steam from the plant and use it as the primary source of heat, using the new central heat system only in circumstances where it could not obtain heat from the lessee. The Air Force asked the U.S. Army Corps of Engineers to begin designing a heat system in April 2012, before it released its request for qualifications for the enhanced-use lease. Around this time, the Air Force asked the U.S. Army Corps of Engineers to conduct a study to evaluate the relative advantages of a central versus a

decentralized heat system.⁵³ The study, completed in August 2012, found that a decentralized heat system would cost less than a centralized heat system. Air Force officials said that the concern was about what type of fuel would be used for the heat system. The design of the heat system was put on hold for a month, in September 2012, while Air Force officials reviewed the completed study and finalized consensus on the preferred heating system. Some Air Force officials thought that whether the enhanced-use lease succeeded would affect the design of the heat system. Air Force officials decided to restart the design with a decentralized heat system in October 2012, prior to the December 2012 due date for the responses to the request for qualifications for the enhanced-use lease. Air Force officials said that they concluded from the August study that a decentralized heat plant would be preferable whether or not the enhanced-use lease succeeded. Air Force and Army officials told us that, as the Army conducted further studies on the decentralized heat system, several technical issues emerged with the design, including concerns regarding how to keep the water pipelines from freezing. Officials said that these technical issues, which were at times associated with high costs, affected the direction of the design for the heat system. In April 2013, the U.S. Army Corps of Engineers studied the costs of using three to four low-pressure steam heat plants, which would resolve the technical complication that had emerged. However, this revised design raised new concerns, such as the logistics of refueling the heat plants each day using small vehicles and the proximity of the heat plants to the buildings where personnel are located. As of February 2014, the U.S. Army Corps of Engineers had not completed the design of the heat system, but the currently preferred design is two medium-sized buildings, each containing three steam boilers. The third boiler in each building would serve as backup for the other two. Additionally, if one of the building's boilers failed, Air Force officials said that the other building's boilers would be able to supply enough heat for the entire composite area. Officials said that using this configuration would address the concerns raised by previous designs of the heat system, including fueling logistics and proximity to personnel.

⁵³The study compared a centralized steam plant against a decentralized hot water boiler system, both of which would be oil-fired.

Agency Comments and Our Evaluation

In written comments on a draft of our restricted report, the Air Force concurred with our observations. The Air Force noted that, overall, our report documents the extensive studies and analyses that the Air Force conducted. The Air Force noted that it was these studies and analyses that led to the Air Force's ultimate decision to tie to the electrical grid, build supplemental heat plants, and eventually decommission the central heat and power plant. The Air Force stated that it concurred with the draft restricted report, with comments. These comments were technical in nature and were incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Defense, and the Secretary of the Air Force. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-4523 or leporeb@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Brian J. Lepore
Director, Defense Capabilities and Management

List of Committees

The Honorable Tim Johnson
Chair
The Honorable Mark Kirk
Ranking Member
Subcommittee on Military Construction, Veterans Affairs and Related
Agencies
Committee on Appropriations
United States Senate

The Honorable John Culberson
Chair
The Honorable Sanford Bishop
Ranking Member
Subcommittee on Military Construction, Veterans Affairs, and Related
Agencies
Committee on Appropriations
House of Representatives

Appendix I: Scope and Methodology

To determine the extent to which the Air Force has evaluated options for the Clear Air Force Station combined heat and power plant, we reviewed the documentation for the project, including the 2010 feasibility study, contract data, Department of Defense (DOD) and Air Force guidance, and the Air Force analyses used to document and support the service's final determination for the plant, including the environmental assessment and subsequent finding of no significant impact for the tie-in to the local grid and construction of a new heat system.¹ Specifically, we reviewed the Air Force's guidance on economic analyses and business-case analyses and its enhanced-use lease playbook that is used to develop enhanced-use lease projects.² We reviewed the documentation the Air Force provided us and talked with appropriate Air Force officials at Headquarters Air Force, Air Force Space Command, 21st Space Wing, and the Air Force Civil Engineer Center. We compared the Air Force's documentation and actions against the guidelines provided in the Air Force's guidance. We also reviewed the Air Force's November 2010 feasibility study that assessed the estimated costs of maintaining the status quo at the Clear Air Force Station power plant against five options. We looked at the economic analyses for each option and the status quo and reviewed the calculations for the estimated costs provided. We assessed the study's assumptions against Air Force guidance on economic analyses and business-case analyses. We discussed the studies, analyses, contracts, and other documentation with appropriate officials from Headquarters Air Force, Air Force Space Command, 21st Space Wing, Clear Air Force Station, the Air Force Civil Engineer Center,³ and the U.S. Army Corps of Engineers. We reviewed the Air Force's analyses regarding its decision to close the power plant; however, we did not analyze all of the underlying data used to support those analyses. We also met with officials from Usibelli Coal Mine and Golden Valley Electric Association. Further, we spoke with Defense Logistics Agency–Energy officials about the existing coal contract as well as current and potential future contracts for other fuel sources, such as diesel. Finally, we interviewed Missile Defense

¹We did not evaluate the environmental assessment and finding of no significant impact against environmental statutes and regulations.

²We did not separately evaluate the Air Force's guidance.

³The Air Force Civil Engineer Center is the Air Force's civil engineer field operating agency responsible for providing engineering services to installations. Its missions include, among others, facility investment planning, design and construction, operations support, real-property management, energy support, and environmental compliance.

Agency officials for information on their roles in the current decision and the potential effect of future radar upgrades on the installation's energy needs.

To determine what other options, if any, the Air Force considered before deciding on the alternative power source it selected, we reviewed the Air Force's analyses on the options it considered, including the concept opportunity study, which first laid out some options for the plant, and the feasibility study. We also reviewed documentation related to additional analyses that were not included in those two studies. We spoke with appropriate officials from Headquarters Air Force, Air Force Space Command, 21st Space Wing, Clear Air Force Station, the Air Force Civil Engineer Center, and the U.S. Army Corps of Engineers regarding how the options for the plant were vetted and the factors that the Air Force took into account in its decision making. Additionally, we spoke with representatives of Doyon Utilities, Golden Valley Electric Association, and Aurora Energy and with plant employees regarding their perspectives on the enhanced-use lease process.

Table 3 below identifies the organizations and offices that we contacted during our review.

Table 3: Command Organizations and Offices Contacted during Our Review

Organization or office	Location
Office of the Secretary of Defense	
Office of the Deputy Under Secretary of Defense for Installations and Environment, Facilities Energy and Privatization Directorate	Washington, D.C.
Air Force	
Assistant Secretary of the Air Force for Installations, Environment, and Logistics	Washington, D.C.
Headquarters Air Force	Washington, D.C.
Headquarters Air Force Space Command	Peterson Air Force Base, Colorado
Headquarters 21st Space Wing	Peterson Air Force Base, Colorado
Air Force Civil Engineer Center	Tyndall Air Force Base, Florida, and Joint Base San Antonio, Texas
772nd Enterprise Sourcing Squadron ^a	Tyndall Air Force Base, Florida
Alaska	
13th Space Warning Squadron	Clear Air Force Station, Alaska

Organization or office	Location
213th Space Warning Squadron	Clear Air Force Station, Alaska
BAE, base operating support contractor	Clear Air Force Station, Alaska
Power plant personnel, including American Federation of Government Employees representative	Clear Air Force Station, Alaska
Doyon Utilities	Fairbanks, Alaska
Golden Valley Electric Association	Fairbanks, Alaska
Usibelli Coal Mine and Aurora Energy	Fairbanks, Alaska
U.S. Army Corps of Engineers, Alaska District	Anchorage, Alaska
Other DOD Agencies	
Defense Logistics Agency—Energy	Fort Belvoir, Virginia
Missile Defense Agency	Huntsville, Alabama

Source: GAO.

^aThe 772nd Enterprise Sourcing Squadron is part of the Air Force Installation Contracting Agency, which is headquartered at Wright-Patterson Air Force Base, Ohio. The squadron has a flight located at Tyndall Air Force Base, Florida.

We conducted this performance audit from October 2013 through May 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Development of Feasibility Study

In August 2009, Air Force Space Command requested the establishment of a working group comprising personnel from Clear Air Force Station, the 21st Space Wing, the Air Force Civil Engineer Support Agency, the Air Force Real Property Agency¹, and the major command to develop a feasibility study for the plant. This team developed a set of five possible options for the plant that represented the highest-ranked and best known alternatives based on the experience and knowledge of the team. In May of 2010, the Air Force Civil Engineer Support Agency and the Air Force Real Property Agency conducted a joint visit to Clear Air Force Station in which team members performed a site survey of the installation's water, waste treatment, and power plant; conducted a site-orientation visit of the plant; and interviewed representatives from the local utility, Golden Valley Electric Association. This site survey and site-orientation visit, along with additional market and technical research, became the basis for the feasibility study.

The working group also agreed to use the Government Should Cost Estimate as the basis for developing cost models to analyze each of the five proposed operating models in the feasibility study.² The feasibility study laid out five options, which were compared against the baseline costs, or status quo, of operating the plant. The company CH2M Hill, under contract to the Air Force, developed the status quo analysis, which was termed the Government Should Cost Estimate and which assumed that (1) the power plant would continue to be operated in the same manner as in 2009 and (2) the equipment, buildings, and inventory would be replaced with inventory similar to what is currently in place. The status quo identified estimated costs over the 50-year period of the analysis, including the following:

- Annual operation and maintenance costs of \$8.87 million per year. These costs include the labor costs for Air Force civilian personnel to

¹The Air Force Civil Engineer Support Agency was formerly responsible for aspects of Air Force engineering and military construction projects. The Air Force Real Property Agency was formerly responsible for aspects of real-property issues, including enhanced-use leases. On October 1, 2012, the Air Force merged these two agencies with another of its engineering agencies to form a single unit to execute its civil-engineering mission worldwide.

²The feasibility study describes the Government Should Cost Estimate as what the government should expect to pay over the next 50 years to own and operate the plant in the same manner as in 2009.

operate the plant, fuel costs, the cost of contracted maintenance services, and the cost associated with environmental permits. Power plant employees operate and maintain the plant equipment, whereas the base operating support contractor conducts basic maintenance of the installation's buildings, including lights and ventilation.

- Annual general and administrative costs of \$1.12 million per year.
- Costs for repairing and replacing power plant components over the 50-year period (termed "R&R" costs), which totaled \$392.55 million.
- Costs for life-extension projects expected to occur in the initial 5 years of the analysis period (2010 through 2014), which totaled \$22.73 million. These initial system deficiency correction items were identified by plant personnel as needing immediate attention and were documented as part of the CH2M Hill site survey.

The repair and replacement and initial system deficiency corrections are intended to increase the life of the current plant until 2030, at which point the status quo estimate assumes that the Air Force will need to replace the existing plant at a cost of \$254.99 million. At this point the plant would be 69 years old. The costs that make up the Government Should Cost Estimate are summarized in table 4 below, which represents the estimated costs of continuing to operate and maintain the existing plant for the next 50 years. These estimates are presented as net present value in 2010 funds.

Table 4: Government Should Cost Estimate Summary of Costs

Cost category	Estimated cost over 50-year period (2010 dollars)
Operation and maintenance ^a	\$276,003,000
Repair and replacement	210,003,000
Life-extension projects	20,883,000
Total	\$506,919,000

Source: Air Force.

Notes: This is the estimate of baseline costs to operate and maintain the power plant over a 50-year period, starting in 2010. All costs are presented in 2010 dollars.

^aThis figure also includes estimated general and administrative costs.

According to the feasibility study, a cost model analysis was developed to determine the Air Force's capital investment requirements and the average costs of power generation for each of the plant options. The Air Force used the output from the cost models to conduct a comparative

analysis of the options to determine the optimum path forward for the plant. In the comparative analysis, the economic metric used to evaluate the five options was net present value—the sum of all future cash outflows minus inflows discounted to 2010 dollars, calculated over a 50-year period. The Air Force used the 50-year time frame because it considered a 50-year lease to be most likely to be signed. Each option is evaluated over a 50-year period to be consistent with the status quo estimate. We reviewed the broad cost estimates presented for the five options and the status quo in the feasibility study and verified them against the costs presented in the supporting tables for each option. These costs from the Air Force's summary table were presented in table 1.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Brian Lepore, (202) 512-4523 or leporeb@gao.gov

Staff Acknowledgments

In addition to the contact named above, Maria Storts (Assistant Director), Karyn Angulo, Michael Armes, James Ashley, Heather Krause, Ron La Due Lake, Joanne Landesman, Jon Ludwigson, Nadji Mehrzad, Anne Rhodes-Kline, Michael Shaughnessy, Amie Steele Lesser, and Weifei Zheng made key contributions to this report.

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